

Perpetuation of memory storage: a novel mechanism in the long-term maintenance of synaptic plasticity and behavior (abstract)

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The research project that I will develop at the Italian Academy for Advanced Studies at Columbia University and in the laboratory of Eric Kandel at the Department of Neuroscience of Columbia University, aims at clarifying certain aspects of novel biological mechanisms recently proposed to underlie the long-term perpetuation of synaptic plasticity, one of the neural substrates of learning and memory.

In particular, I will focus my investigation on two proteins called cytoplasmic polyadenylation element binding protein (CPEB) and protein kinase C zeta (PKC-zeta), studying their role and interaction in the maintenance of long-term plasticity at synapses of *Aplysia*, a model organism for neurobiological research. In recent years, these two proteins have been shown to have prominent roles in the long-term perpetuation of learning-related synaptic plasticity and behavioral memories. One of the more interesting features of these proteins is that they have some quite unusual structural and functional properties that make them act as molecular switches that - once turned on - sustain the persistence over time of synaptic plasticity and memories.

Specifically, I will work on two main research lines. First, I will try to define in mechanistic terms how the expression level of these two proteins is regulated, during long-term synaptic plasticity, through a balance between their synthesis and degradation. Second, I will try to determine whether these two perpetuators of synaptic plasticity and memory do interact significantly at some level in memory storage, or – alternatively - if they act independently of each other with complementary functions.

This paper, in summarizing the fundamental points of my research project and its more general scientific background, also attempts - as far as I can - at highlighting briefly some points in contemporary neurobiological studies of memory that I consider to be of interest for the humanities. I have organized the paper by following loosely the scheme used in standard biological sciences articles. In the fall semester, I will present the “introduction” and “materials and methods”, followed by a section on the general aims of my research. In the spring semester, I will present the “results” and the “discussion” sections.